Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder — H. H. WINDSOR, Jr., Editor and Publisher

GETTING intimate with lions is all in a day's work for our editors and photographers. When Frank Fritz, PM cameraman, wanted a lion closeup for "School for the Big Cats" (page 80) the trainer handed him a whip and invited Frank into the cage. Cliff Hicks, assistant editor, stepped in with him and shot this picture while Frank was trying to convince his ferocious models it was all in fun. The lions weren't impressed.

NEXT MONTH Stanley Hiller, Jr., young inventor of the first practical co-axial helicopter, answers the question you've been asking—How soon will helicopters be ready for you? Other August features include a story of the speed runs on the Utah salt flats and an article by J. A. Krug, Secretary of the Interior, "Teaching Old Rivers New Tricks."

HOW to row, row, row your boat and really get some place is the theme of a practical article in next month's Craftsman section. Also, you'll appreciate the bending brake described in another story if you've ever tried to make right-angle bends in sheet metal. Photography fans will be intrigued with a "workable darkroom" where articles are never mislaid.

RADIO ham beginners will find an excellent 5-band phone and CW transmitter featured next month in the Radio and Electronics section.

Volume 88 — JULY 1947 — Number 1

In This Issue

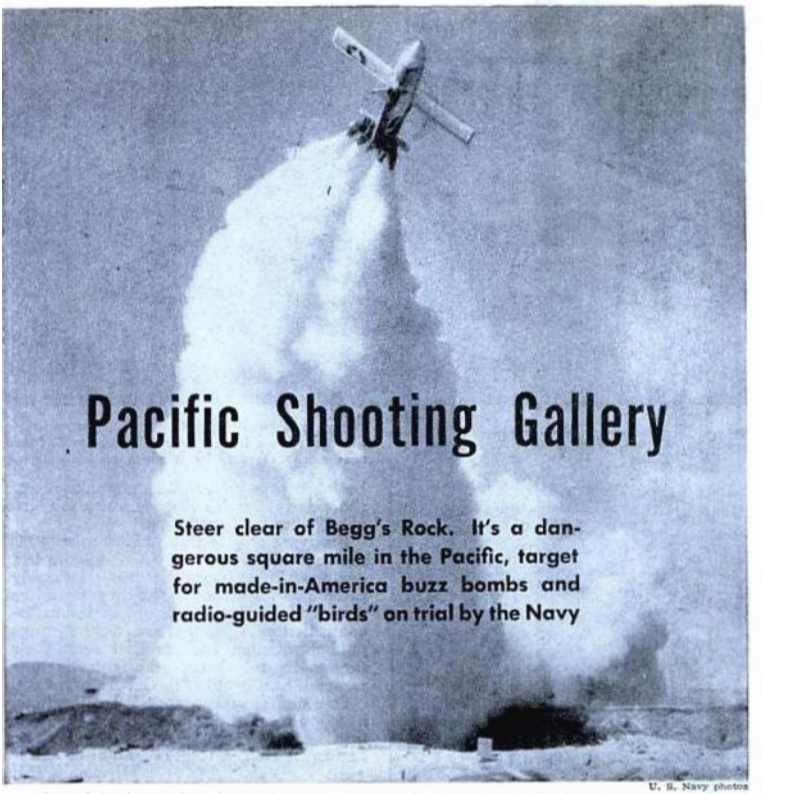
They Fish for Trouble - - - - 73
School for the Big Cats - - - - 80
On Guard—It's Forest Fire Time - 90
Pacific Shooting Gallery - - - - 99
Uncle Sam's Plow Boys - - - - 106
Typewriter Artist - - - - - - 116
Growing a Crop Under Tents - - 132
Standing Room Only - - - - - 137
Flying Fish—At Home Anywhere - 148
Ammunition for the War on Disease 155

For the Craftsman

Luggage From Your Own Shop - - 162
Homemade Fluorescent Fixtures - 170
Checking for Refrigerator Ills - - 186
"Skimmer"—a Plywood Kayak - 190
Modernize That Old Lathe - - - 202
How to Use Concrete - - - - 208
Radio and Electronics - - - - - 213

Table of Contents Continued on Page 8

Published monthly by POPULAR MECHANICS COMPANY, 200 East Ontario Street, Chicago 11, Ill. H. H. Windsor, Jr., president; Paul H. Dunakin, vice president and general manager; D. F. Windsor, vice president and secretary-treasurer; William Harrison Partridge, vice president and assistant to the publisher; Clover L. Perkins, advertising manager; Alan M. Depew, circulation manager. Single copy in the United States and Canada, 25 cents; subscription rates in United States and possessions, Canada, and countries of the Pan-American Postal Union, 1 year, $2.50; 2 years, $4.50; 3 years, $6.00. To all other countries add $1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 60 days in advance so you will not miss an issue. Give both old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office, Toronto, Canada. Printed in the United States of America.



Pacific Shooting Gallery

Steer clear of Begg's Rock. It's a dangerous square mile in the Pacific, target for made-in-America buzz bombs and radio-guided "birds" on trial by the Navy

U. S. Navy photos

Blast of the four rockets, lasting less than two seconds, carries Loon 50 miles out over the ocean

By Thomas E. Stimson, Jr.

INSIDE THE COMBAT information center at Point Mugu, Calif., you focus your attention on a green pip of light traveling slowly back and forth across the translucent radar screen before you.

"That's the P-80," the Navy commander at your elbow explains. "The pilot is waiting for the Loon to be fired, then he will chase it. He has orders to shoot it down if it runs wild."

A steady roaring noise commences outside the building and is quickly lost in a giant swish of sound.

"The bird is on its way," reports a technician with earphones sitting at a charting table. On the radar screen are two pips of light, the bird and the P-80, moving steadily toward the southwest. As you watch, the leading pip begins to veer off to the south. Hastily the commander reaches for his radio control box, dials a number, and holds down a switch for a moment. The pip moves back on course.

"Could have been a strong gust of wind that threw the bird off," he says. "To bring it back on course I dial the amount of turn required and then press the 'left' or 'right' switch to indicate the direction of turn. All the commands go by radio to an automatic pilot on the bird.

"Its altitude is preset and is controlled by a gyro. This other switch on the control box is the dive switch, for diving the missile into its target. We won't use it on this flight because the target is beyond the range of this particular radar. Control will

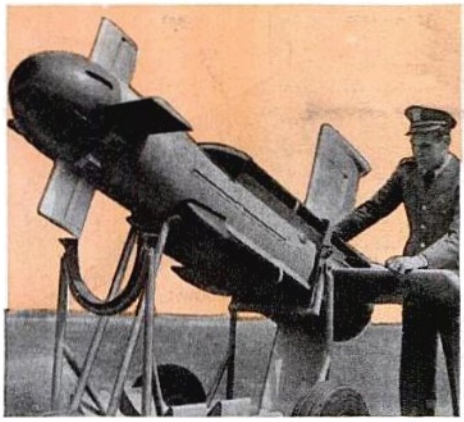
Preparing to launch small target plane, powered by pulse jet engine, from a gunpowder catapult. Open nose carries chute to lower plane on radio signal

be taken over by a radio station on one of the islands 50 miles offshore when the bird approaches the target area."

Studying and testing guided missiles is the function of the Navy's air-missile test center at Point Mugu. Located on a sandy promontory 50 miles up the coast from Los Angeles, the test center evaluates radio-controlled pilotless aircraft, long-range guided missiles, rockets that seek their targets by television, and fantastic new weapons hardly out of the laboratory stage.

One such future weapon is the Neptune, a 235-mile rocket that is expected to get its first tests next June here and at White Sands, N. Mex. A total of 10 will be deliv-

Missile's path is observed on round radar screen and corrections made by means of control panel at left. Lower left, radar feeds data on the flight of the "bird" to a plotting table. Below, interior of a concrete blockhouse from which firing is controlled



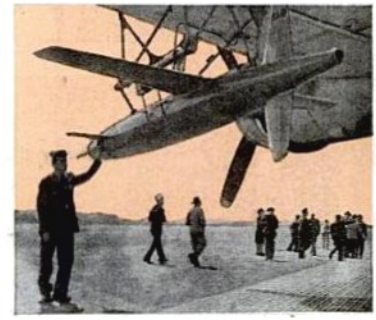
Checking antenna attached to tail of Little Joe, a radio-controlled rocket missile. Oblong window in the nose of Gorgon, upper right and below, allows it to "home" on target after being launched from plane

ered by 1951. The largest rocket which could conveniently be fired from a ship, it will be 45 feet long and carry up to 2000 pounds of measuring instruments. Span across the fins will be 98 inches. Much slenderer than the German V-2 and about a third its weight, the Neptune will be launched from a vertical position.

The stabilization problem is handled by mounting the engine in gimbals, with a gyro guiding changes in direction of thrust. This saves weight, increases thrust for the fuel used and is expected to lengthen the rocket's burning time to 75 seconds, eight seconds longer than the V-2. The engine, fueled with oxygen and alcohol, is being built by Reaction Motors to produce approximately 200,000 pounds thrust for its brief flight.

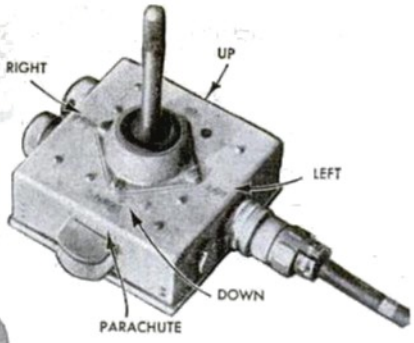
The program is intended to provide basic knowledge and techniques that will be needed if and when the world ever engages in push-button warfare. More specifically, Navy technicians are studying air-to-air, air-to-ship, ship-to-air, and other special purpose missiles. They are seeking for each type the best kind of launching system, air frame, propulsion unit, and guidance system. Propulsion motors in the sonic, transsonic, and supersonic ranges are or will be studied.

Guidance is a big problem all by itself. Among the various systems are the preset mechanisms such as steered the German V-1 and V-2 missiles, target-seeking devices such as direct the Bat glide bomb on a collision course with its target, the command system by which radio impulses or other signals are used to control the missile during flight, and the course-seeking system by which a beam of light or radio energy is pointed at the target and along which the missile flies until it hits the target. More than one of these guidance systems can be used with the same missile.

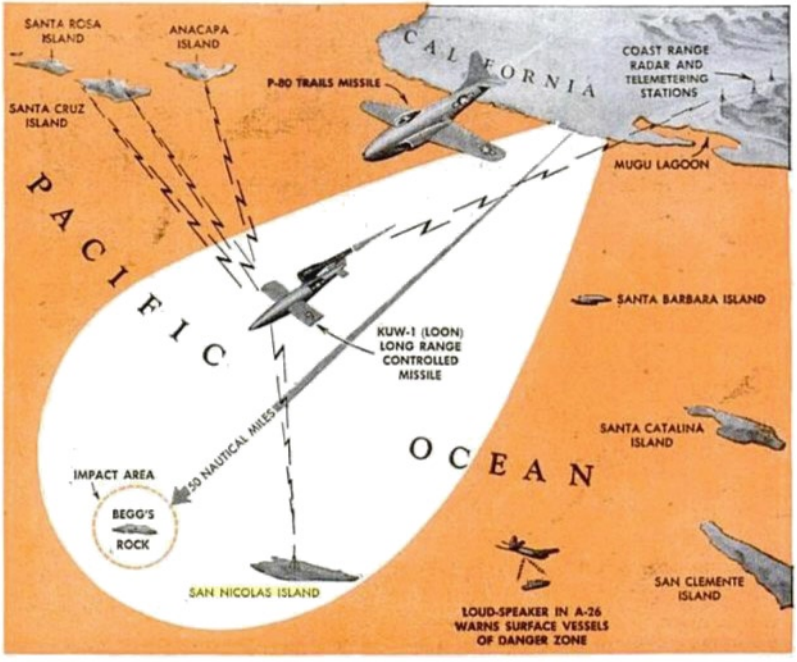


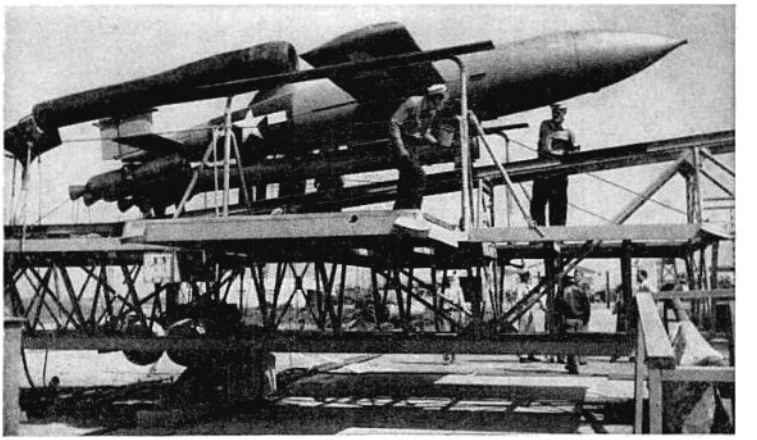
As an "impact area" for this research the Navy uses an area of water, roughly fan-shaped, that extends 80 miles out into the Pacific from Point Mugu. No suitable test range of the desired length could be found ashore. The specific target for most of the long-range missiles is the square mile of ocean that surrounds Begg's Rock, a tiny pinnacle that rises out of the water more than 50 miles offshore. Radar stations on the mountain peaks behind Point Mugu and on several offshore islands are used for watching the missiles while in the air.

When a "bird" is scheduled to be fired,

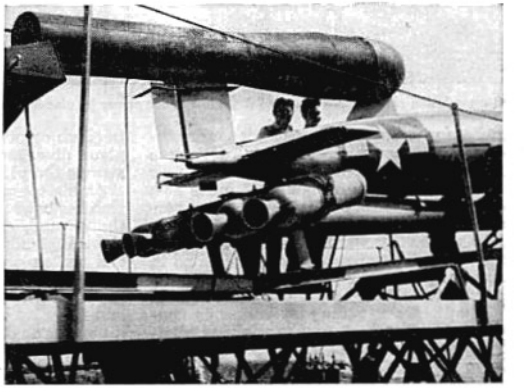


"Pilot" on ground maneuvers target plane by means of radio impulses from control box in his hand to receiver in plane, which in turn operates automatic pilot. Below, the Pacific shooting gallery and the Begg's Rock target





From rocket take-off, above, the Loon gets an impetus of only seven Gs, against 18 from gunpowder catapult. Right, view of four rocket motors below tail



radio warnings are first broadcast to ships and fishing vessels that might be in the area, then radar searches for any vessels that might not have heard the warnings. A patrol plane with a loud-speaker pointing down from its tail is sent to any such ship to warn it to get clear.

Each long-range missile is observed all through its flight by the pilot of the P-80 chaser plane and in addition is tracked by the chain of radar stations. At the same time, instruments inside the missile continuously measure its roll, yaw, pitch, the performance of its various parts, and other data, and transmit this information by telemeter radio to the ground stations.

One of the most useful long-range birds for carrying on some kinds of research is the stub-winged V-1 buzz bomb that is powered by a pulse jet engine. An American version of this German weapon was built in large numbers in the United States during the latter part of the war and some of these are now used as research vehicles.

Designated by the Navy as the KUW-1 and nicknamed the Loon, the improved V-1 missiles have a range of more than 150 miles and a speed in excess of 425 miles per hour. Some are launched from the rails of a 150-foot catapult, the powder charges of which impose an acceleration of 18 Gs on the Loon and build up its speed to 260 miles per hour by the time it leaves the rails.

Other Loons are fired by means of a launching carriage or sled to which are attached four large rocket motors. The rockets drive the sled and Loon up into the air with a force of 7 Gs, then when the motors burn out the sled falls free and the Loon continues on its way.

Smaller missiles that are being studied at Point Mugu include Little Joe, a ship-launched radio-controlled rocket of 2-mile

Gauges inside plane record results of flight test under power by nine-inch pulse jet engine below the fuselage

range for use against suicide planes or other missiles, the radio-controlled Gargoyle for air-to-ground use, and the air-to-air Gorgon that has a range of 12 miles at a speed of 500 miles per hour. Improved versions of the Bat glide bomb are being tested, as is the German X-4 antiaircraft rocket that trails 3½ miles of fine wire behind it, receiving control signals over the wire as a way of avoiding jamming of radio signals.

Simultaneously the test center is conducting research on a wide range of pilotless target aircraft. These small drones have a wing span of around 10 feet. All are controlled by radio from the ground. They are used as targets by antiaircraft gunners and also for the testing of new radio control systems for pilotless aircraft or missiles. Some are powered by conventional gasoline engines, some by pulse jets. Some can fly at the rate of 240 miles per hour, climb 25,000 feet, and remain aloft for more than an hour.

Radio control of the drones has been perfected to the point where the "pilot," standing on the ground, maneuvers one of the craft with as much dexterity as if he actually had his hands on the plane's controls. Holding a small control box from which protrudes a switch handle similar to the control stick of an airplane, the pilot pulls back on the stick to cause the drone to climb or pushes it forward to make the plane dive. Moving the stick left or right swings the plane in the desired direction.

At his command the plane loops, spins, shuttles back and forth only a few feet off the ground, or climbs practically out of sight. He lands the plane by tripping a special switch on the side of the box. This switch sends out the radio impulse that pops open a hatch in the plane's fuselage and frees its parachute, at the same time killing its engine. The plane floats down to a slow landing.

Push-button warfare is still in the future. "We are not yet ready to push the button," remarks Captain A. B. Scoles, director of tests at Point Mugu, "but we are doing everything possible to wire up the button so that if the occasion arises, our buzz will be just as loud and just as effective as the other fellow's."

Chemical Coating Insulates Exhaust Pipes

Fire danger from hot exhaust pipes is lessened by a chemical coating which kills 90 percent of the visible red glow and invisible infrared radiation. The coating, made from oxides of calcium, titanium and antimony, is the outgrowth of wartime research to develop a material to black out the red glow created by bomber exhaust pipes.